



Flax response to N and P fertilizer

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On sites testing low in nitrogen (N) fertility, flax yields were 39% higher with rates of 90 lbs. N side-banded per acre. Flax response to phosphorus (P) averaged 7% and rates of no more than 18 to 36 side-banded P_2O_5 per acre were justified. Phosphorus response occurred only in the presence of good N fertility.

This project evaluated the flax yield response to applications of varying rates of side-banded N and P fertilizer under a broad range of environmental conditions, and to investigate potential interactions among the nutrients.

The three-year study ran from 2016 through 2018 at six locations in Saskatchewan (Indian Head, Melfort, Redvers, Scott, Swift Current and Yorkton), Vegreville, Alberta and Brandon, Manitoba. Four N rates of 12, 45, 90, 134 lbs. N/acre (13, 50, 100 and 150 kg N/ha) of urea (46-0-0) and four P rates of 0, 18, 36, 54 lbs. P_2O_5 per acre (0, 20, 40 and 60 kg P_2O_5 /ha) of monoammonium phosphate (11-52-0) were applied. All of the plots were direct-seeded into cereal stubble and all fertilizer was side-banded during seeding, except at the Vegreville site, which included mid-row banded fertilizer.

Plant density, days to maturity, seed yield, and test weight were measured. Residual NO_3-N was variable across locations ranging from a low of 7 lbs. NO_3-N per acre at one site to a high of 92 lbs.

per acre at 2 sites. Phosphorus levels were relatively low at less than 10 ppm (Olsen P) at 63% of the sites with a low of 3 to 4 ppm at 6 sites and a maximum of 24 ppm at one site.

Flax emergence decreased with increasing N

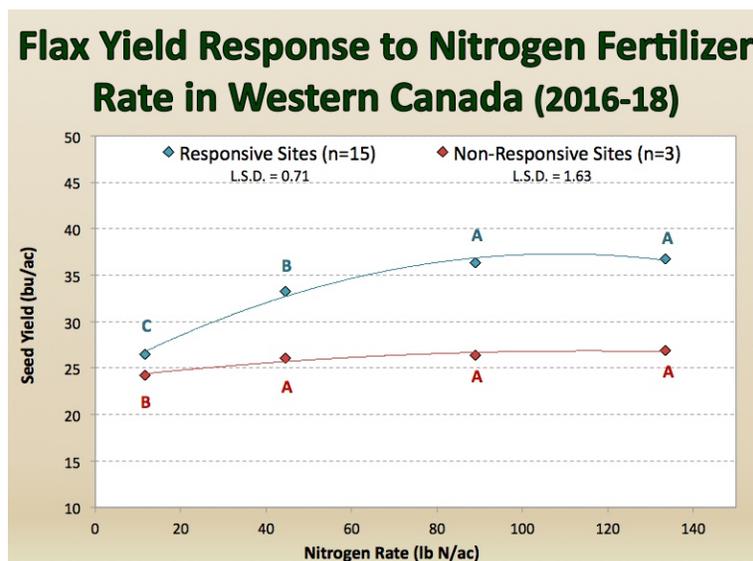
Flax emergence was sensitive to side-banded urea. Three-quarters of the sites had reduced stand establishment as N rate increased. In these sites, a linear response was observed with a 28% reduction in plant densities when the N rate was increased from 12 lbs. N/acre to 134 lbs./ac. This reduced plant stands from 42 to 32 plants/ft² on average. However, these plant stand densities remained within the recommended targets of 30 to 40 plants/ft². Side-banded monoammonium phosphate did not affect plant density, regardless of rate.

Minimal effect on maturity

Increasing N rate delayed maturity 71% of the time. The average delay was 2.4 days (99.2 to 101.6 days) at N responsive sites when the N rate was increased from 12 lbs. to 134 lbs. N/acre. Phosphorus rate did not have a noticeable effect on flax maturity.

Yield response to both N and P

Flax yield increased with N fertilization at the 15 N responsive sites. Flax yielded an average of 26.5 bu./ac at 12 lbs. N/acre leveling off at 36 bu./ac between the 90 and 134 lbs. N/acre rates for an average yield increase of 39%. However, the response was weak at 3 of 18 site-years where either residual N was high, or yields were more limited by other environmental factors. At the 3 less responsive sites the average yield response was 11% (2 bu./ac), and there was little benefit to fertilizer rates exceeding 45 lbs. N/acre.



Flax yield response to P fertilizer was more modest, averaging 7% (2.3 bu./ac) across all site-years. While the response was linear with increasing P rates, the increase wasn't large enough to justify rates exceeding 18 to 36 lbs. P₂O₅/acre.

Additionally, the response to P only occurred when N fertilizer was also applied. Flax yields increased with P rates when 45 to 134 lbs. N/acre were also applied, but no yield increase was observed at the lowest 12 lbs. N/acre rate.

Minor impact on test weight

The only factor to have any impact on flax test weight was N fertilizer rate. However, a response occurred less than half the time and, when it did, it was too small to be of any practical importance.

The project showed benefits to both nitrogen and phosphorus fertilization. The majority of locations had a relatively strong response to N with an average yield increase of 39% and maximum yields of 36 bu./ac achieved at approximately 90 lbs. N/acre. Rates of 18 to 36 lbs./ P₂O₅ may be enough to prevent significant yield loss and maintain soil fertility. Interactions between N and P were minimal and the response to P was weaker at the lowest N rate where N was essentially always limiting to yield.

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Holzapfel, C., Schoenau, J., Pratchler, J., Hall, M., Mohr, R., Weber, J., Nybo, B., Shaw, L., and Slaski, J. 2018. Flax Response to a Wide Range of Nitrogen & Phosphorus Fertilizer Rates in Western Canada. IHARF ADF Project Final Report

<https://iharf.ca/wp-content/uploads/2019/05/Flax-response-to-a-wide-range-of-N-P-fertilizer-rates-final-report.pdf>